Electronic Supplementary Material (ESI) for Green Chemistry.

Supporting Information

Lignin Nano- and Microparticles as Template for Nanostructured Materials: Formation of Hollow Metal-Phenolic Capsules

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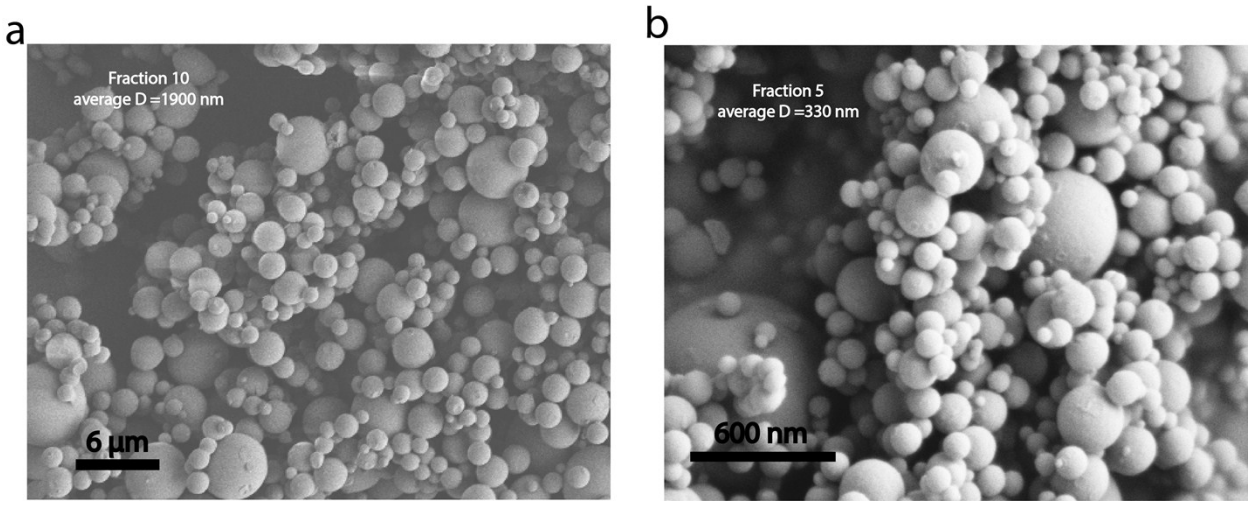

Figure S1. SEM micrographs of kraft lignin particle templates of 2 different size fractions (a) 1.9 µm average diameter and (b) 330 nm average diameter.

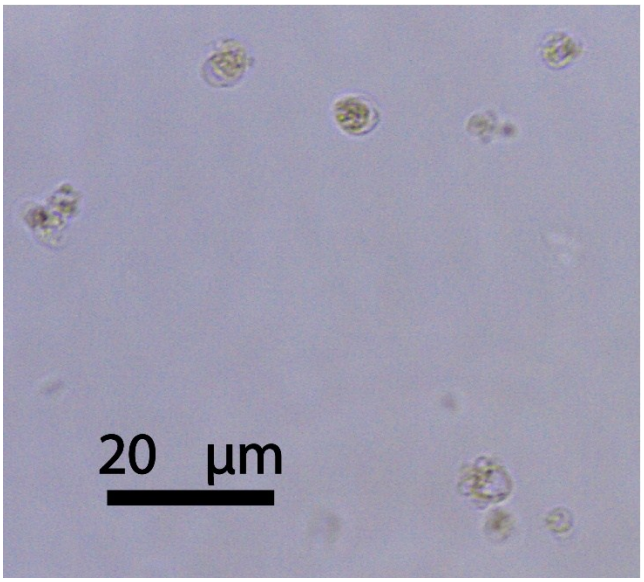

Figure S2. Micrograph obtained by bright field microscopy of MPN-coated lignin particle templates after exposure to 1:1 DMF:water. The noticeable brown color highlights the presence of residual lignin.

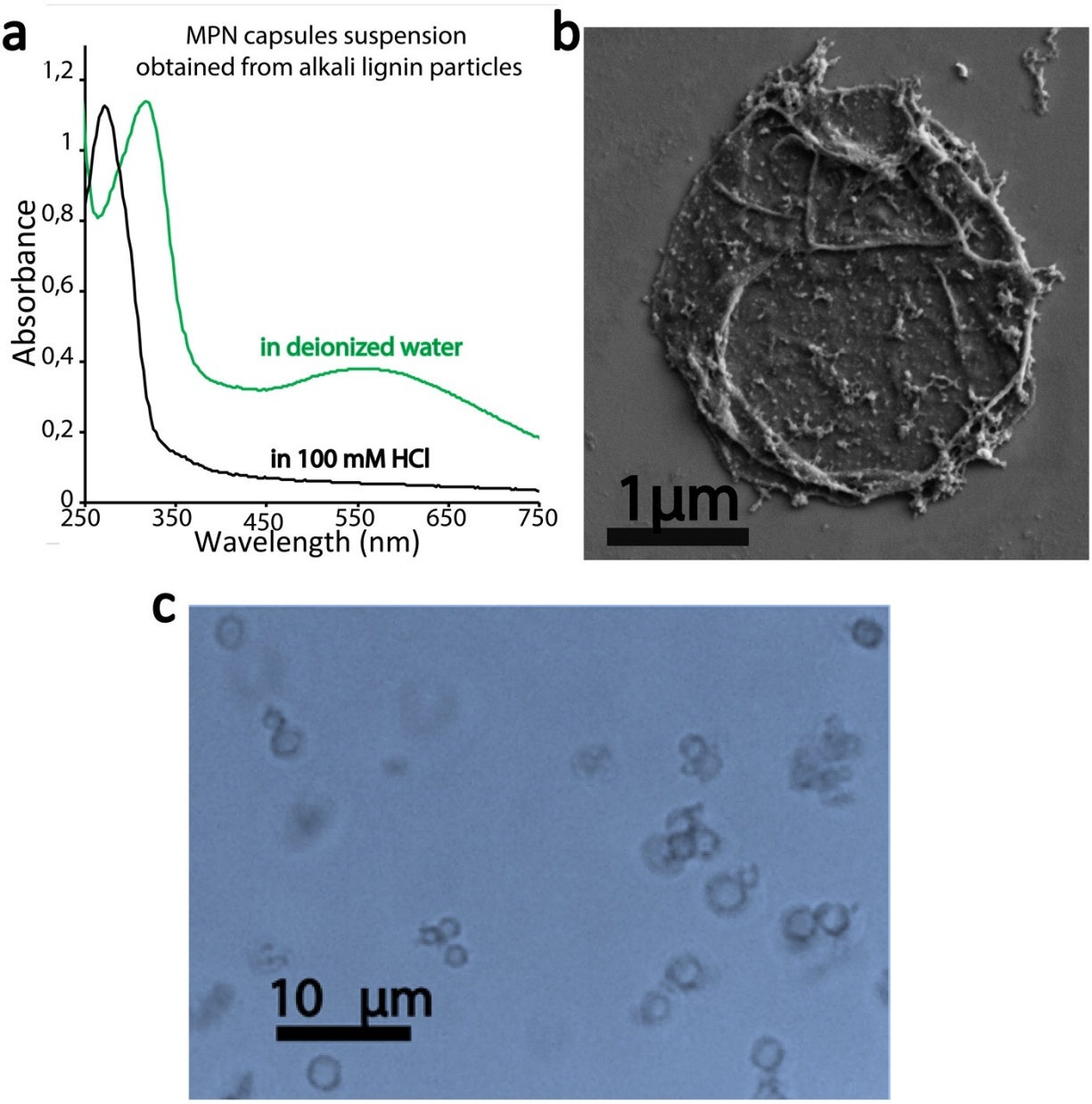

Figure S3. a) UV-Vis spectra obtained from MPN capsule suspensions obtained from alkali lignin particles before and after their degradation in acids. b) SEM micrograph of a collapsed MPN capsule formed from alkali lignin particles and c) micrograph obtained by bright field microscopy of MPN capsules prepared in acetone from alkali lignin microparticles.

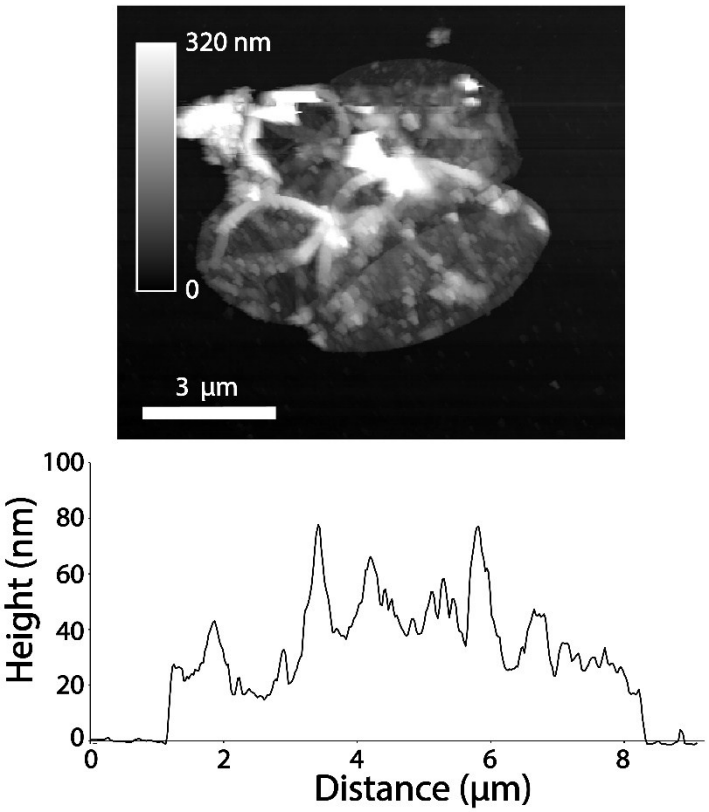

Figure S4. Atomic force microscopy micrograph of a collapsed MPN capsule obtained using kraft lignin particles as templates with a size of ca. 10 µm (top) and profilometric analysis (bottom). A single layer thickness of ca. 10 nm can be extrapolated from the minimum thickness as it corresponds to the shell collapsed over itself.

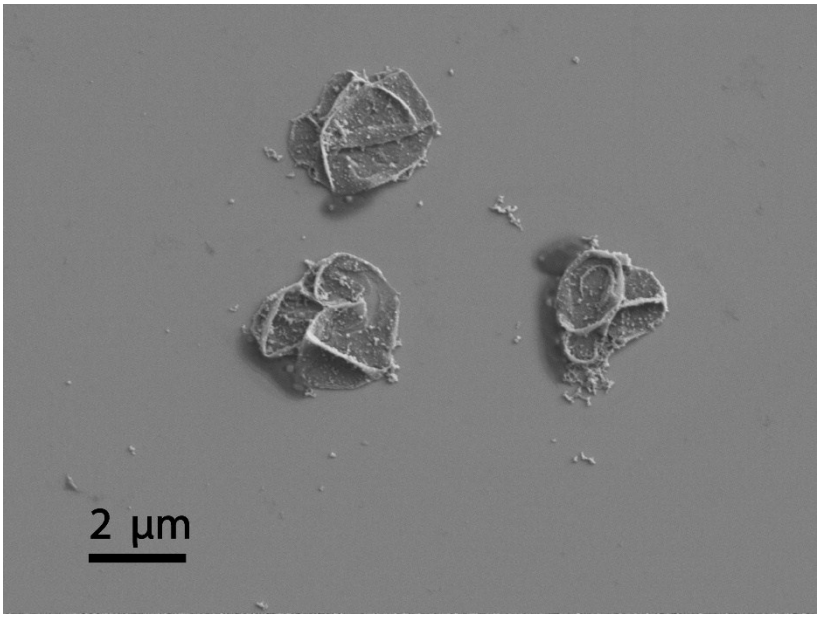

Figure S5. SEM micrograph of collapsed MPN capsules obtained by dissolving the lignin microparticle templates in DMF.

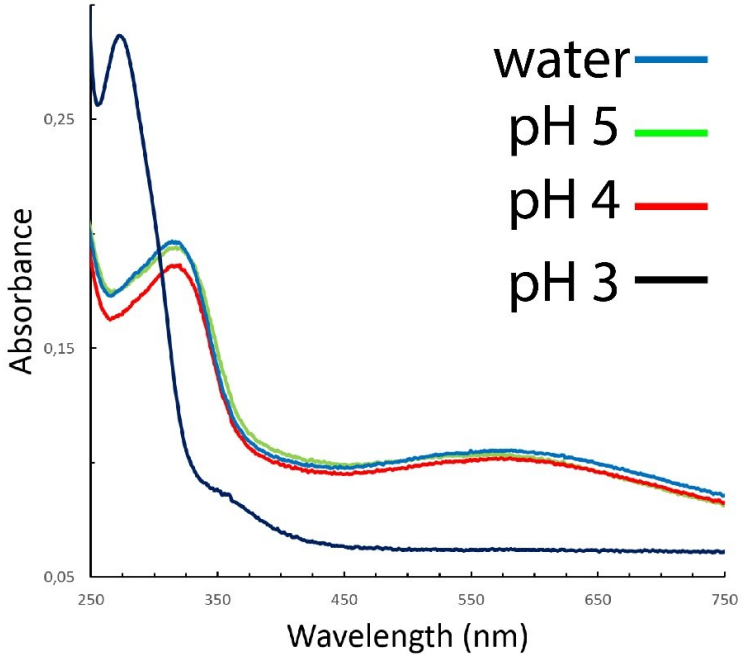

Figure S6. UV-Vis absorption spectra from MPN capsules after 1 hour in different solvents. Buffered solutions (pH 3-5) were in sodium acetate (50 mM).

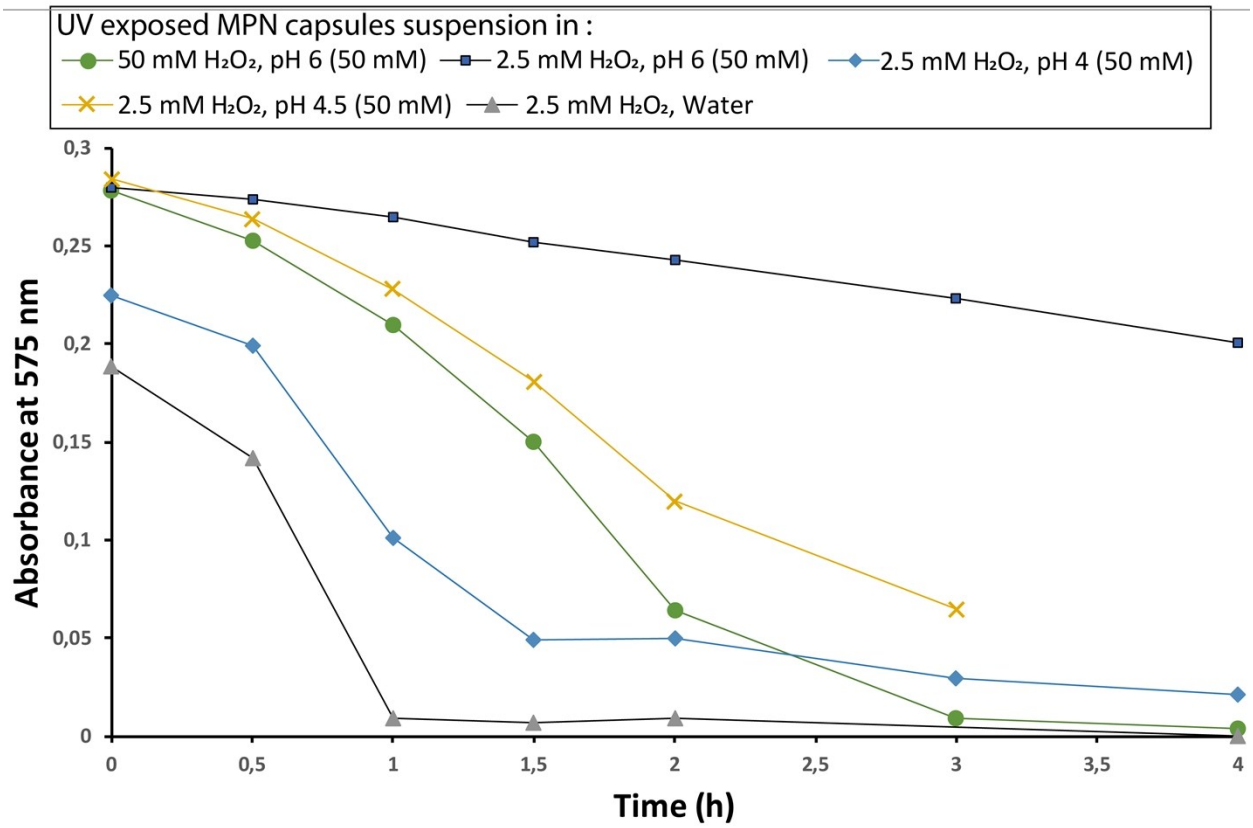

Figure S7. Control experiments establishing stability of the MPN capsules at various conditions. The capsules are more rapidly degraded in the presence of higher concentrations of H_2O_2 or at lower pHs.

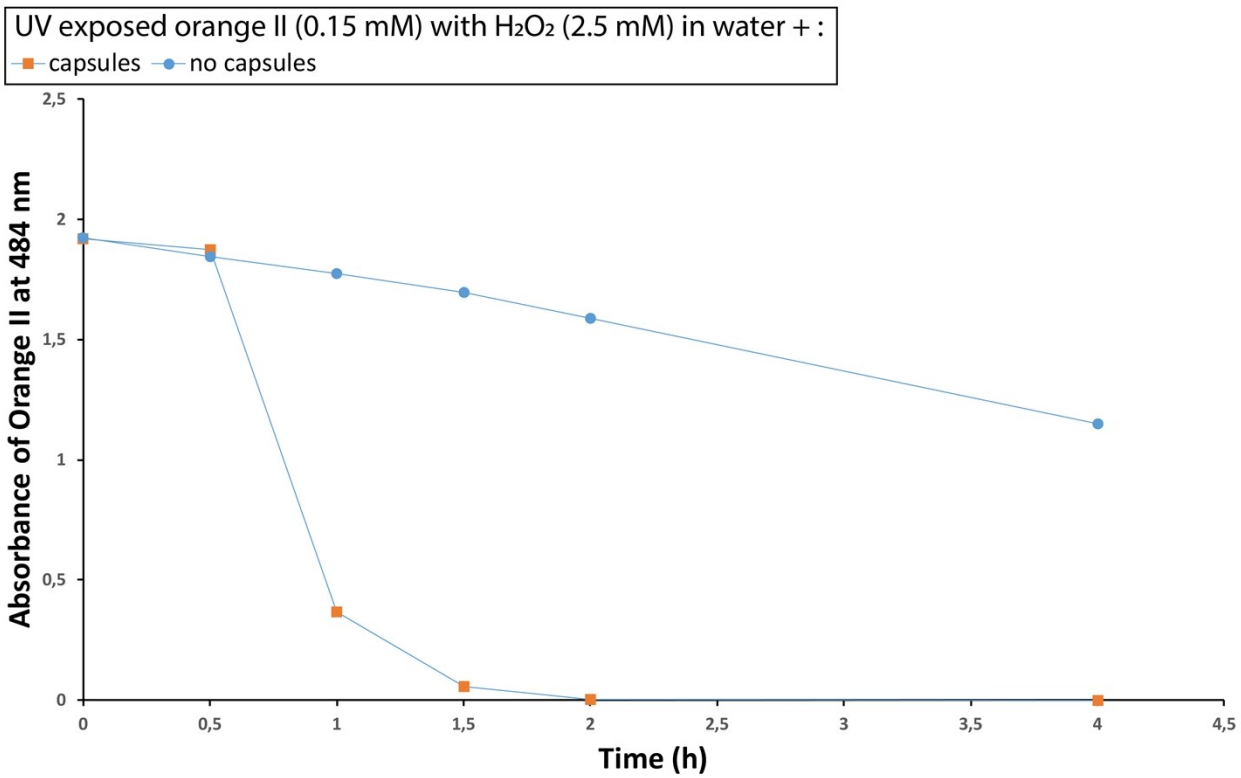

Figure S8. Catalytic effect of MPN capsules on Orange II degradation by using UV-based exposure and H_2O_2 in the absence of buffers.

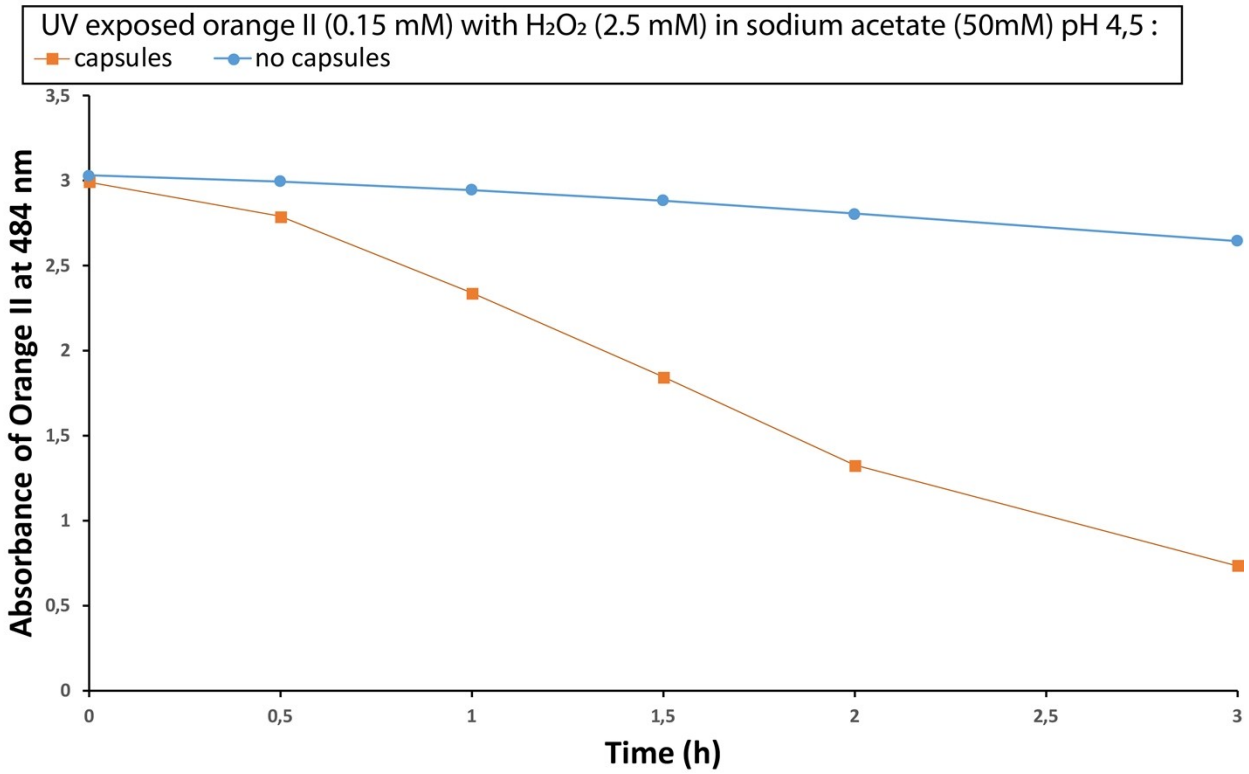

Figure S9. Catalytic effect of MPN capsules on Orange II degradation by using UV-based exposure and H_2O_2 in a solution buffered at pH 4.5 (sodium acetate, 50 mM).

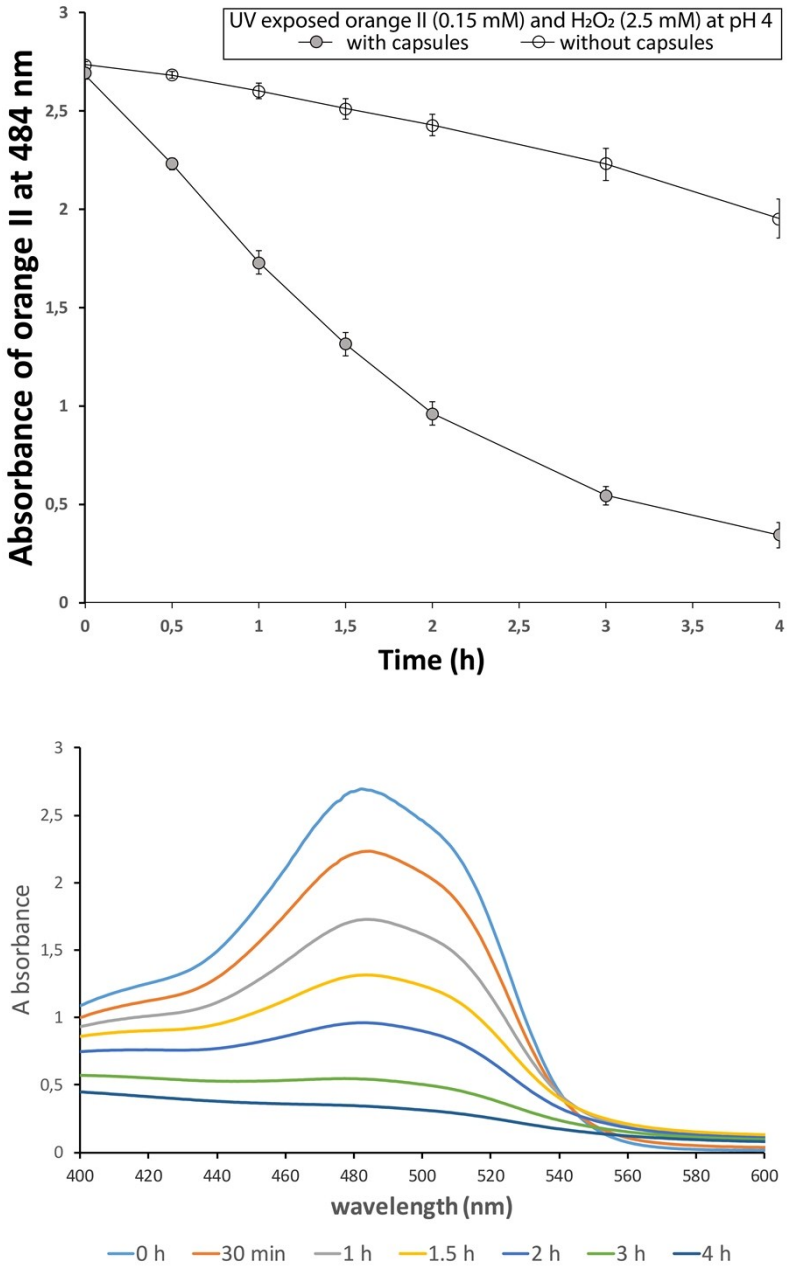

Figure S9. (Top) Absorbance-based catalytic effect of MPN capsules on Orange II degradation by using UV-based exposure and H_2O_2 in a solution buffered at pH 4 (sodium acetate, 50 mM). (Bottom) UV-Vis spectra as a function of time highlighting significant degradation of Orange II.